

SEQUENCE LISTING

<110> Franz Ertl, Peter  
Wayne Gough, Gerald  
Jeffrey Alan Ring, Christopher  
Parmar, Vanita  
Marina Walcott, Sarah

<120> Papilloma Virus Sequences

<130> PG4082-1C1

<140> Unassigned  
<141> Herewith

<150> 09/939, 471  
<151> 2001-08-24

<150> PCT/GB01/03290  
<151> 2000-07-21

<150> GB0017990.3  
<151> 2000-11-02

<160> 21

<170> FastSEQ for Windows Version 4.0

<210> 1  
<211> 649  
<212> PRT  
<213> Human papillomavirus type 6a

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Ser Asp Asp Glu Asp Glu Glu Val Glu Asp Ser Gly Tyr Asp Met Val  
35 40 45  
Asp Phe Ile Asp Asp Ser Asn Ile Thr His Asn Ser Leu Glu Ala Gln  
50 55 60  
Ala Leu Phe Asn Arg Gln Glu Ala Asp Thr His Tyr Ala Thr Val Gln  
65 70 75 80  
Asp Leu Lys Arg Lys Tyr Leu Gly Ser Pro Tyr Val Ser Pro Ile Asn  
85 90 95  
Thr Ile Ala Glu Ala Val Glu Ser Glu Ile Ser Pro Arg Leu Asp Ala  
100 105 110  
Ile Lys Leu Thr Arg Gln Pro Lys Lys Val Lys Arg Arg Leu Phe Gln  
115 120 125  
Thr Arg Glu Leu Thr Asp Ser Gly Tyr Gly Tyr Ser Glu Val Glu Ala  
130 135 140  
Gly Thr Gly Thr Gln Val Glu Lys His Gly Val Pro Glu Asn Gly Gly  
145 150 155 160  
Asp Gly Gln Glu Lys Asp Thr Gly Arg Asp Ile Glu Gly Glu His  
165 170 175  
Thr Glu Ala Glu Ala Pro Thr Asn Ser Val Arg Glu His Ala Gly Thr  
180 185 190  
Ala Gly Ile Leu Glu Leu Leu Lys Cys Lys Asp Leu Arg Ala Ala Leu  
195 200 205  
Leu Gly Lys Phe Lys Glu Cys Phe Gly Leu Ser Phe Ile Asp Leu Ile  
210 215 220  
Arg Pro Phe Lys Ser Asp Lys Thr Thr Cys Leu Asp Trp Val Val Ala  
225 230 235 240  
Gly Phe Gly Ile His His Ser Ile Ser Glu Ala Phe Gln Lys Leu Ile  
245 250 255  
Glu Pro Leu Ser Leu Tyr Ala His Ile Gln Trp Leu Thr Asn Ala Trp  
260 265 270  
Gly Met Val Leu Leu Val Leu Leu Arg Phe Lys Val Asn Lys Ser Arg  
275 280 285  
Ser Thr Val Ala Arg Thr Leu Ala Thr Leu Leu Asn Ile Pro Glu Asn  
290 295 300  
Gln Met Leu Ile Glu Pro Pro Lys Ile Gln Ser Gly Val Ala Ala Leu  
305 310 315 320  
Tyr Trp Phe Arg Thr Gly Ile Ser Asn Ala Ser Thr Val Ile Gly Glu  
325 330 335  
Ala Pro Glu Trp Ile Thr Arg Gln Thr Val Ile Glu His Gly Leu Ala  
340 345 350

Asp Ser Gln Phe Lys Leu Thr Glu Met Val Gln Trp Ala Tyr Asp Asn  
355 360 365  
Asp Ile Cys Glu Glu Ser Glu Ile Ala Phe Glu Tyr Ala Gln Arg Gly  
370 375 380  
Asp Phe Asp Ser Asn Ala Arg Ala Phe Leu Asn Ser Asn Met Gln Ala  
385 390 395 400  
Lys Tyr Val Lys Asp Cys Ala Thr Met Cys Arg His Tyr Lys His Ala  
405 410 415  
Glu Met Arg Lys Met Ser Ile Lys Gln Trp Ile Lys His Arg Gly Ser  
420 425 430  
Lys Ile Glu Gly Thr Gly Asn Trp Lys Pro Ile Val Gln Phe Leu Arg  
435 440 445  
His Gln Asn Ile Glu Phe Ile Pro Phe Leu Thr Lys Phe Lys Leu Trp  
450 455 460  
Leu His Gly Thr Pro Lys Lys Asn Cys Ile Ala Ile Val Gly Pro Pro  
465 470 475 480  
Asp Thr Gly Lys Ser Tyr Phe Cys Met Ser Leu Ile Ser Phe Leu Gly  
485 490 495  
Gly Thr Val Ile Ser His Val Asn Ser Ser Ser His Phe Trp Leu Gln  
500 505 510  
Pro Leu Val Asp Ala Lys Val Ala Leu Leu Asp Asp Ala Thr Gln Pro  
515 520 525  
Cys Trp Ile Tyr Met Asp Thr Tyr Met Arg Asn Leu Leu Asp Gly Asn  
530 535 540  
Pro Met Ser Ile Asp Arg Lys His Lys Ala Leu Thr Leu Ile Lys Cys  
545 550 555 560  
Pro Pro Leu Leu Val Thr Ser Asn Ile Asp Ile Thr Lys Glu Asp Lys  
565 570 575  
Tyr Lys Tyr Leu His Thr Arg Val Thr Thr Phe Thr Phe Pro Asn Pro  
580 585 590  
Phe Pro Phe Asp Arg Asn Gly Asn Ala Val Tyr Glu Leu Ser Asn Thr  
595 600 605  
Asn Trp Lys Cys Phe Phe Glu Arg Leu Ser Ser Ser Leu Asp Ile Gln  
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Asp Ser Glu Asp Glu Glu Asp Gly Ser Asn Ser Gln Ala Phe Arg Cys  
625 630 635 640  
Val Pro Gly Thr Val Val Arg Thr Leu  
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<210> 2  
<211> 649  
<212> PRT  
<213> Human papillomavirus type 6a

<400> 2

Met Ala Asp Asp Ser Gly Thr Glu Asn Glu Gly Ser Gly Cys Thr Gly  
1 5 10 15

Trp Phe Met Val Glu Ala Ile Val Gln His Pro Thr Gly Thr Gln Ile  
20 25 30

Ser Asp Asp Glu Asp Glu Glu Val Glu Asp Ser Gly Tyr Asp Met Val  
35 40 45

Asp Phe Ile Asp Asp Ser Asn Ile Thr His Asn Ser Leu Glu Ala Gln  
50 55 60

Ala Leu Phe Asn Arg Gln Glu Ala Asp Thr His Tyr Ala Thr Val Gln  
65 70 75 80

Asp Leu Lys Arg Lys Tyr Leu Gly Ser Pro Tyr Val Ser Pro Ile Asn  
85 90 95

Thr Ile Ala Glu Ala Val Glu Ser Glu Ile Ser Pro Arg Leu Asp Ala  
100 105 110

Ile Lys Leu Thr Arg Gln Pro Lys Lys Val Lys Arg Arg Leu Phe Gln  
115 120 125

Thr Arg Glu Leu Thr Asp Ser Gly Tyr Gly Ser Glu Val Glu Ala  
130 135 140

Gly Thr Gly Thr Gln Val Glu Lys His Gly Val Pro Glu Asn Gly Gly  
145 150 155 160

Asp Gly Gln Glu Lys Asp Thr Gly Arg Asp Ile Glu Gly Glu His  
165 170 175

Thr Glu Ala Glu Ala Pro Thr Asn Ser Val Arg Glu His Ala Gly Thr  
180 185 190

Ala Gly Ile Leu Glu Leu Leu Lys Cys Lys Asp Leu Arg Ala Ala Leu  
195 200 205

Leu Gly Lys Phe Lys Glu Cys Phe Gly Leu Ser Phe Ile Asp Leu Ile  
210 215 220

Arg Pro Phe Lys Ser Asp Lys Thr Thr Cys Ala Asp Trp Val Val Ala  
225 230 235 240

Gly Phe Gly Ile His His Ser Ile Ser Glu Ala Phe Gln Lys Leu Ile  
245 250 255

Glu Pro Leu Ser Leu Tyr Ala His Ile Gln Trp Leu Thr Asn Ala Trp  
260 265 270

Gly Met Val Leu Leu Val Leu Val Arg Phe Lys Val Asn Lys Ser Arg  
275 280 285  
Ser Thr Val Ala Arg Thr Leu Ala Thr Leu Leu Asn Ile Pro Asp Asn  
290 295 300  
Gln Met Leu Ile Glu Pro Pro Lys Ile Gln Ser Gly Val Ala Ala Leu  
305 310 315 320  
Tyr Trp Phe Arg Thr Gly Ile Ser Asn Ala Ser Thr Val Ile Gly Glu  
325 330 335  
Ala Pro Glu Trp Ile Thr Arg Gln Thr Val Ile Glu His Gly Leu Ala  
340 345 350  
Asp Ser Gln Phe Lys Leu Thr Glu Met Val Gln Trp Ala Tyr Asp Asn  
355 360 365  
Asp Ile Cys Glu Glu Ser Glu Ile Ala Phe Glu Tyr Ala Gln Arg Gly  
370 375 380  
Asp Phe Asp Ser Asn Ala Arg Ala Phe Leu Asn Ser Asn Met Gln Ala  
385 390 395 400  
Lys Tyr Val Lys Asp Cys Ala Thr Met Cys Arg His Tyr Lys His Ala  
405 . 410 415  
Glu Met Arg Lys Met Ser Ile Lys Gln Trp Ile Lys His Arg Gly Ser  
420 425 430  
Lys Ile Glu Gly Thr Gly Asn Trp Lys Pro Ile Val Gln Phe Leu Arg  
435 440 445  
His Gln Asn Ile Glu Phe Ile Pro Phe Leu Ser Lys Phe Lys Leu Trp  
450 455 460  
Leu His Gly Thr Pro Lys Lys Asn Cys Ile Ala Ile Val Gly Pro Pro  
465 470 475 480  
Asp Thr Gly Lys Ser Tyr Phe Cys Met Ser Leu Ile Ser Phe Leu Gly  
485 . 490 495  
Gly Thr Val Ile Ser His Val Asn Ser Ser Ser His Phe Trp Leu Gln  
500 505 510  
Pro Leu Val Asp Ala Lys Val Ala Leu Leu Asp Asp Ala Thr Gln Pro  
515 520 525  
Cys Trp Ile Tyr Met Asp Thr Tyr Met Arg Asn Leu Leu Asp Gly Asn  
530 535 540  
Pro Met Ser Ile Asp Arg Lys His Lys Ala Leu Thr Leu Ile Lys Cys  
545 550 555 560  
Pro Pro Leu Leu Val Thr Ser Asn Ile Asp Ile Thr Lys Glu Glu Lys  
565 570 575  
Tyr Lys Tyr Leu His Thr Arg Val Thr Thr Phe Thr Phe Pro Asn Pro  
580 585 590

Phe Pro Phe Asp Arg Asn Gly Asn Ala Val Tyr Glu Leu Ser Asn Ala  
595 600 605  
Asn Trp Lys Cys Phe Phe Glu Arg Leu Ser Ser Ser Leu Asp Ile Gln  
610 615 620  
Asp Ser Glu Asp Glu Glu Asp Gly Ser Asn Ser Gln Ala Phe Arg Cys  
625 630 635 640  
Val Pro Gly Thr Val Val Arg Thr Leu  
645

<210> 3  
<211> 649  
<212> PRT  
<213> Human papillomavirus type 11

<400> 3  
Met Ala Asp Asp Ser Gly Thr Glu Asn Glu Gly Ser Gly Cys Thr Gly  
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Trp Phe Met Val Glu Ala Ile Val Glu His Thr Thr Gly Thr Gln Ile  
20 25 30  
Ser Glu Asp Glu Glu Glu Val Glu Asp Ser Gly Tyr Asp Met Val  
35 40 45  
Asp Phe Ile Asp Asp Arg His Ile Thr Gln Asn Ser Val Glu Ala Gln  
50 55 60  
Ala Leu Phe Asn Arg Gln Glu Ala Asp Ala His Tyr Ala Thr Val Gln  
65 70 75 80  
Asp Leu Lys Arg Lys Tyr Leu Gly Ser Pro Tyr Val Ser Pro Ile Ser  
85 90 95  
Asn Val Ala Asn Ala Val Glu Ser Glu Ile Ser Pro Arg Leu Asp Ala  
100 105 110  
Ile Lys Leu Thr Thr Gln Pro Lys Val Lys Arg Arg Leu Phe Glu  
115 120 125  
Thr Arg Glu Leu Thr Asp Ser Gly Tyr Gly Tyr Ser Glu Val Glu Ala  
130 135 140  
Ala Thr Gln Val Glu Lys His Gly Asp Pro Glu Asn Gly Gly Asp Gly  
145 150 155 160  
Gln Glu Arg Asp Thr Gly Arg Asp Ile Glu Gly Glu Gly Val Glu His  
165 170 175  
Arg Glu Ala Glu Ala Val Asp Asp Ser Thr Arg Glu His Ala Asp Thr  
180 185 190

Ser Gly Ile Leu Glu Leu Leu Lys Cys Lys Asp Ile Arg Ser Thr Leu  
195 200 205  
His Gly Lys Phe Lys Asp Cys Phe Gly Leu Ser Phe Val Asp Leu Ile  
210 215 220  
Arg Pro Phe Lys Ser Asp Arg Thr Thr Cys Ala Asp Trp Val Val Ala  
225 230 235 240  
Gly Phe Gly Ile His His Ser Ile Ala Asp Ala Phe Gln Lys Leu Ile  
245 250 255  
Glu Pro Leu Ser Leu Tyr Ala His Ile Gln Trp Leu Thr Asn Ala Trp  
260 265 270  
Gly Met Val Leu Leu Val Leu Ile Arg Phe Lys Val Asn Lys Ser Arg  
275 280 285  
Cys Thr Val Ala Arg Thr Leu Gly Thr Leu Leu Asn Ile Pro Glu Asn  
290 295 300  
His Met Leu Ile Glu Pro Pro Lys Ile Gln Ser Gly Val Arg Ala Leu  
305 310 315 320  
Tyr Trp Phe Arg Thr Gly Ile Ser Asn Ala Ser Thr Val Ile Gly Glu  
325 330 335  
Ala Pro Glu Trp Ile Thr Arg Gln Thr Val Ile Glu His Ser Leu Ala  
340 345 350  
Asp Ser Gln Phe Lys Leu Thr Glu Met Val Gln Trp Ala Tyr Asp Asn  
355 360 365  
Asp Ile Cys Glu Glu Ser Glu Ile Ala Phe Glu Tyr Ala Gln Arg Gly  
370 375 380  
Asp Phe Asp Ser Asn Ala Arg Ala Phe Leu Asn Ser Asn Met Gln Ala  
385 390 395 400  
Lys Tyr Val Lys Asp Cys Ala Ile Met Cys Arg His Tyr Lys His Ala  
405 410 415  
Glu Met Lys Lys Met Ser Ile Lys Gln Trp Ile Lys Tyr Arg Gly Thr  
420 425 430  
Lys Val Asp Ser Val Gly Asn Trp Lys Pro Ile Val Gln Phe Leu Arg  
435 440 445  
His Gln Asn Ile Glu Phe Ile Pro Phe Leu Ser Lys Leu Lys Leu Trp  
450 455 460  
Leu His Gly Thr Pro Lys Lys Asn Cys Ile Ala Ile Val Gly Pro Pro  
465 470 475 480  
Asp Thr Gly Lys Ser Cys Phe Cys Met Ser Leu Ile Lys Phe Leu Gly  
485 490 495  
Gly Thr Val Ile Ser Tyr Val Asn Ser Cys Ser His Phe Trp Leu Gln  
500 505 510

Pro Leu Thr Asp Ala Lys Val Ala Leu Leu Asp Asp Ala Thr Gln Pro  
515 520 525  
Cys Trp Thr Tyr Met Asp Thr Tyr Met Arg Asn Leu Leu Asp Gly Asn  
530 535 540  
Pro Met Ser Ile Asp Arg Lys His Arg Ala Leu Thr Leu Ile Lys Cys  
545 550 555 560  
Pro Pro Leu Leu Val Thr Ser Asn Ile Asp Ile Ser Lys Glu Glu Lys  
565 570 575  
Tyr Lys Tyr Leu His Ser Arg Val Thr Thr Phe Thr Phe Pro Asn Pro  
580 585 590  
Phe Pro Phe Asp Arg Asn Gly Asn Ala Val Tyr Glu Leu Ser Asp Ala  
595 600 605  
Asn Trp Lys Cys Phe Phe Glu Arg Leu Ser Ser Ser Leu Asp Ile Glu  
610 615 620  
Asp Ser Glu Asp Glu Glu Asp Gly Ser Asn Ser Gln Ala Phe Arg Cys  
625 630 635 640  
Val Pro Gly Ser Val Val Arg Thr Leu  
645

<210> 4  
<211> 649  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> HPV6b E1 amino acid sequence including point  
mutations to remove biological activity

<400> 4  
Met Ala Asp Asp Ser Gly Thr Glu Asn Glu Gly Ser Gly Cys Thr Gly  
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Trp Phe Met Val Glu Ala Ile Val Gln His Pro Thr Gly Thr Gln Ile  
20 25 30  
Ser Asp Asp Glu Asp Glu Val Glu Asp Ser Gly Tyr Asp Met Val  
35 40 45  
Asp Phe Ile Asp Asp Ser Asn Ile Thr His Asn Ser Leu Glu Ala Gln  
50 55 60  
Ala Leu Phe Asn Arg Gln Glu Ala Asp Thr His Tyr Ala Thr Val Gln  
65 70 75 80

Asp Leu Gly Gly Lys Tyr Leu Gly Ser Pro Tyr Val Ser Pro Ile Asn  
85 90 95  
Thr Ile Ala Glu Ala Val Glu Ser Glu Ile Ser Pro Arg Leu Asp Ala  
100 105 110  
Ile Lys Leu Thr Arg Gln Pro Lys Lys Val Lys Arg Arg Leu Phe Gln  
115 120 125  
Thr Arg Glu Leu Thr Asp Ser Gly Tyr Gly Tyr Ser Glu Val Glu Ala  
130 135 140  
Gly Thr Gly Thr Gln Val Glu Lys His Gly Val Pro Glu Asn Gly Gly  
145 150 155 160  
Asp Gly Gln Glu Lys Asp Thr Gly Arg Asp Ile Glu Gly Glu His  
165 170 175  
Thr Glu Ala Glu Ala Pro Thr Asn Ser Val Arg Glu His Ala Gly Thr  
180 185 190  
Ala Gly Ile Leu Glu Leu Leu Lys Cys Lys Asp Leu Arg Ala Ala Leu  
195 200 205  
Leu Gly Lys Phe Lys Glu Cys Phe Gly Leu Ser Phe Ile Asp Leu Ile  
210 215 220  
Arg Pro Phe Lys Ser Asp Lys Thr Thr Cys Leu Asp Trp Val Val Ala  
225 230 235 240  
Gly Phe Gly Ile His His Ser Ile Ser Glu Ala Phe Gln Lys Leu Ile  
245 250 255  
Glu Pro Leu Ser Leu Tyr Ala His Ile Gln Trp Leu Thr Asn Ala Trp  
260 265 270  
Gly Met Val Leu Leu Val Leu Leu Arg Phe Lys Val Asn Lys Ser Arg  
275 280 285  
Ser Thr Val Ala Arg Thr Leu Ala Thr Leu Leu Asn Ile Pro Glu Asn  
290 295 300  
Gln Met Leu Ile Glu Pro Pro Lys Ile Gln Ser Gly Val Ala Ala Leu  
305 310 315 320  
Tyr Trp Phe Arg Thr Gly Ile Ser Asn Ala Ser Thr Val Ile Gly Glu  
325 330 335  
Ala Pro Glu Trp Ile Thr Arg Gln Thr Val Ile Glu His Gly Leu Ala  
340 345 350  
Asp Ser Gln Phe Lys Leu Thr Glu Met Val Gln Trp Ala Tyr Asp Asn  
355 360 365  
Asp Ile Cys Glu Glu Ser Glu Ile Ala Phe Glu Tyr Ala Gln Arg Gly  
370 375 380  
Asp Phe Asp Ser Asn Ala Arg Ala Phe Leu Asn Ser Asn Met Gln Ala  
385 390 395 400

Lys Tyr Val Lys Asp Cys Ala Thr Met Cys Arg His Tyr Lys His Ala  
405 410 415  
Glu Met Arg Lys Met Ser Ile Lys Gln Trp Ile Lys His Arg Gly Ser  
420 425 430  
Lys Ile Glu Gly Thr Gly Asn Trp Lys Pro Ile Val Gln Phe Leu Arg  
435 440 445  
His Gln Asn Ile Glu Phe Ile Pro Phe Leu Thr Lys Phe Lys Leu Trp  
450 455 460  
Leu His Gly Thr Pro Lys Lys Asn Cys Ile Ala Ile Val Gly Pro Pro  
465 470 475 480  
Asp Thr Asp Lys Ser Tyr Phe Cys Met Ser Leu Ile Ser Phe Leu Gly  
485 490 495  
Gly Thr Val Ile Ser His Val Asn Ser Ser Ser His Phe Trp Leu Gln  
500 505 510  
Pro Leu Val Asp Ala Lys Val Ala Leu Leu Asp Asp Ala Thr Gln Pro  
515 520 525  
Cys Trp Ile Tyr Met Asp Thr Tyr Met Arg Asn Leu Leu Asp Gly Asn  
530 535 540  
Pro Met Ser Ile Asp Arg Lys His Lys Ala Leu Thr Leu Ile Lys Cys  
545 550 555 560  
Pro Pro Leu Leu Val Thr Ser Asn Ile Asp Ile Thr Lys Glu Asp Lys  
565 570 575  
Tyr Lys Tyr Leu His Thr Arg Val Thr Phe Thr Phe Pro Asn Pro  
580 585 590  
Phe Pro Phe Asp Arg Asn Gly Asn Ala Val Tyr Glu Leu Ser Asn Thr  
595 600 605  
Asn Trp Lys Cys Phe Phe Glu Arg Leu Ser Ser Ser Leu Asp Ile Gln  
610 615 620  
Asp Ser Glu Asp Glu Glu Asp Gly Ser Asn Ser Gln Ala Phe Arg Cys  
625 630 635 640  
Val Pro Gly Thr Val Val Arg Thr Leu  
645

<210> 5  
<211> 367  
<212> PRT  
<213> Human papillomavirus type 11

<400> 5

Met Glu Ala Ile Ala Lys Arg Leu Asp Ala Cys Gln Asp Gln Leu Leu  
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Glu Leu Tyr Glu Glu Asn Ser Ile Asp Ile His Lys His Ile Met His  
20 25 30  
Trp Lys Cys Ile Arg Leu Glu Ser Val Leu Leu His Lys Ala Lys Gln  
35 40 45  
Met Gly Leu Ser His Ile Gly Leu Gln Val Val Pro Pro Leu Thr Val  
50 55 60  
Ser Glu Thr Lys Gly His Asn Ala Ile Glu Met Gln Met His Leu Glu  
65 70 75 80  
Ser Leu Ala Lys Thr Gln Tyr Gly Val Glu Pro Trp Thr Leu Gln Asp  
85 90 95  
Thr Ser Tyr Glu Met Trp Leu Thr Pro Pro Lys Arg Cys Phe Lys Lys  
100 105 110  
Gln Gly Asn Thr Val Glu Val Lys Phe Asp Gly Cys Glu Asp Asn Val  
115 120 125  
Met Glu Tyr Val Val Trp Thr His Ile Tyr Leu Gln Asp Asn Asp Ser  
130 135 140  
Trp Val Lys Val Thr Ser Ser Val Asp Ala Lys Gly Ile Tyr Tyr Thr  
145 150 155 160  
Cys Gly Gln Phe Lys Thr Tyr Tyr Val Asn Phe Asn Lys Glu Ala Gln  
165 170 175  
Lys Tyr Gly Ser Thr Asn His Trp Glu Val Cys Tyr Gly Ser Thr Val  
180 185 190  
Ile Cys Ser Pro Ala Ser Val Ser Ser Thr Val Arg Glu Val Ser Ile  
195 200 205  
Ala Glu Pro Thr Thr Tyr Thr Pro Ala Gln Thr Thr Ala Pro Thr Val  
210 215 220  
Ser Ala Cys Thr Thr Glu Asp Gly Val Ser Ala Pro Pro Arg Lys Arg  
225 230 235 240  
Ala Arg Gly Pro Ser Thr Asn Asn Thr Leu Cys Val Ala Asn Ile Arg  
245 250 255  
Ser Val Asp Ser Thr Ile Asn Asn Ile Val Thr Asp Asn Tyr Asn Lys  
260 265 270  
His Gln Arg Arg Asn Asn Cys His Ser Ala Ala Thr Pro Ile Val Gln  
275 280 285  
Leu Gln Gly Asp Ser Asn Cys Leu Lys Cys Phe Arg Tyr Arg Leu Asn  
290 295 300  
Asp Lys Tyr Lys His Leu Phe Glu Leu Ala Ser Ser Thr Trp His Trp  
305 310 315 320

Ala Ser Pro Glu Ala Pro His Lys Asn Ala Ile Val Thr Leu Thr Tyr			
325	330	335	
Ser Ser Glu Glu Gln Arg Gln Gln Phe Leu Asn Ser Val Lys Ile Pro			
340	345	350	
Pro Thr Ile Arg His Lys Val Gly Phe Met Ser Leu His Leu Leu			
355	360	365	

<210> 6  
 <211> 368  
 <212> PRT  
 <213> Human papillomavirus type 6a

<400> 6			
Met Glu Ala Ile Ala Lys Arg Leu Asp Ala Cys Gln Glu Gln Leu Leu			
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Glu Leu Tyr Glu Glu Asn Ser Thr Asp Leu Asn Lys His Val Leu His			
20	25	30	
Trp Lys Cys Met Arg His Glu Ser Val Leu Leu Tyr Lys Ala Lys Gln			
35	40	45	
Met Gly Leu Ser His Ile Gly Met Gln Val Val Pro Pro Leu Lys Val			
50	55	60	
Ser Glu Ala Lys Gly His Asn Ala Ile Glu Met Gln Met His Leu Glu			
65	70	75	80
Ser Leu Leu Lys Thr Glu Tyr Ser Met Glu Pro Trp Thr Leu Gln Glu			
85	90	95	
Thr Ser Tyr Glu Met Trp Gln Thr Pro Pro Lys Arg Cys Phe Lys Lys			
100	105	110	
Arg Gly Lys Thr Val Glu Val Lys Phe Asp Gly Cys Ala Asn Asn Thr			
115	120	125	
Met Asp Tyr Val Val Trp Thr Asp Val Tyr Val Gln Asp Thr Asp Ser			
130	135	140	
Trp Val Lys Val His Ser Met Val Asp Ala Lys Gly Ile Tyr Tyr Thr			
145	150	155	160
Cys Gly Gln Phe Lys Thr Tyr Tyr Val Asn Phe Val Lys Glu Ala Glu			
165	170	175	
Lys Tyr Gly Ser Thr Lys Gln Trp Glu Val Cys Tyr Gly Ser Thr Val			
180	185	190	
Ile Cys Ser Pro Ala Ser Val Ser Ser Thr Thr Gln Glu Val Ser Ile			
195	200	205	

Pro Glu Ser Thr Thr Tyr Thr Pro Ala Gln Thr Ser Thr Pro Val Ser  
 210 215 220  
 Ser Ser Thr Gln Glu Asp Ala Val Gln Thr Pro Pro Arg Lys Arg Ala  
 225 230 235 240  
 Arg Gly Val Gln Gln Ser Pro Cys Asn Ala Leu Cys Val Ala His Ile  
 245 250 255  
 Gly Pro Val Asp Ser Gly Asn His Asn Leu Ile Thr Asn Asn His Asp  
 260 265 270  
 Gln His Gln Arg Arg Asn Asn Ser Asn Ser Ala Thr Pro Ile Val  
 275 280 285  
 Gln Phe Gln Gly Glu Ser Asn Cys Leu Lys Cys Phe Arg Tyr Arg Leu  
 290 295 300  
 Asn Asp Lys His Arg His Leu Phe Asp Leu Ile Ser Ser Thr Trp His  
 305 310 315 320  
 Trp Ala Ser Pro Lys Ala Pro His Lys His Ala Ile Val Thr Val Thr  
 325 330 335  
 Tyr His Ser Glu Glu Gln Arg Gln Gln Phe Leu Asn Val Val Lys Ile  
 340 345 350  
 Pro Pro Thr Ile Arg His Lys Leu Gly Phe Met Ser Leu His Leu Leu  
 355 360 365

<210> 7  
 <211> 368  
 <212> PRT  
 <213> Human papillomavirus type 6b

<400> 7

Met Glu Ala Ile Ala Lys Arg Leu Asp Ala Cys Gln Glu Gln Leu Leu  
 1 5 10 15  
 Glu Leu Tyr Glu Glu Asn Ser Thr Asp Leu His Lys His Val Leu His  
 20 25 30  
 Trp Lys Cys Met Arg His Glu Ser Val Leu Leu Tyr Lys Ala Lys Gln  
 35 40 45  
 Met Gly Leu Ser His Ile Gly Met Gln Val Val Pro Pro Leu Lys Val  
 50 55 60  
 Ser Glu Ala Lys Gly His Asn Ala Ile Glu Met Gln Met His Leu Glu  
 65 70 75 80  
 Ser Leu Leu Arg Thr Glu Tyr Ser Met Glu Pro Trp Thr Leu Gln Glu  
 85 90 95

Thr Ser Tyr Glu Met Trp Gln Thr Pro Pro Lys Arg Cys Phe Lys Lys  
100 105 110  
Arg Gly Lys Thr Val Glu Val Lys Phe Asp Gly Cys Ala Asn Asn Thr  
115 120 125  
Met Asp Tyr Val Val Trp Thr Asp Val Tyr Val Gln Asp Asn Asp Thr  
130 135 140  
Trp Val Lys Val His Ser Met Val Asp Ala Lys Gly Ile Tyr Tyr Thr  
145 150 155 160  
Cys Gly Gln Phe Lys Thr Tyr Tyr Val Asn Phe Val Lys Glu Ala Glu  
165 170 175  
Lys Tyr Gly Ser Thr Lys His Trp Glu Val Cys Tyr Gly Ser Thr Val  
180 185 190  
Ile Cys Ser Pro Ala Ser Val Ser Ser Thr Thr Gln Glu Val Ser Ile  
195 200 205  
Pro Glu Ser Thr Thr Tyr Thr Pro Ala Gln Thr Ser Thr Leu Val Ser  
210 215 220  
Ser Ser Thr Lys Glu Asp Ala Val Gln Thr Pro Pro Arg Lys Arg Ala  
225 230 235 240  
Arg Gly Val Gln Gln Ser Pro Cys Asn Ala Leu Cys Val Ala His Ile  
245 250 255  
Gly Pro Val Asp Ser Gly Asn His Asn Leu Ile Thr Asn Asn His Asp  
260 265 270  
Gln His Gln Arg Arg Asn Asn Ser Asn Ser Ser Ala Thr Pro Ile Val  
275 280 285  
Gln Phe Gln Gly Glu Ser Asn Cys Leu Lys Cys Phe Arg Tyr Arg Leu  
290 295 300  
Asn Asp Arg His Arg His Leu Phe Asp Leu Ile Ser Ser Thr Trp His  
305 310 315 320  
Trp Ala Ser Ser Lys Ala Pro His Lys His Ala Ile Val Thr Val Thr  
325 330 335  
Tyr Asp Ser Glu Glu Gln Arg Gln Gln Phe Leu Asp Val Val Lys Ile  
340 345 350  
Pro Pro Thr Ile Ser His Lys Leu Gly Phe Met Ser Leu His Leu Leu  
355 360 365

<210> 8  
<211> 367  
<212> PRT  
<213> Artificial Sequence

<220>

<223> HPV11 E2 amino acid sequence including a point mutation to remove biological activity

<400> 8

Met	Glu	Ala	Ile	Ala	Lys	Arg	Leu	Asp	Ala	Cys	Gln	Asp	Gln	Leu	Leu
1			5				10							15	
Glu	Leu	Tyr	Glu	Glu	Asn	Ser	Ile	Asp	Ile	His	Lys	His	Ile	Met	His
	20						25							30	
Trp	Lys	Cys	Ile	Arg	Leu	Glu	Ser	Val	Leu	Leu	His	Lys	Ala	Lys	Gln
	35						40							45	
Met	Gly	Leu	Ser	His	Ile	Gly	Leu	Gln	Val	Val	Pro	Pro	Leu	Thr	Val
	50						55							60	
Ser	Glu	Thr	Lys	Gly	His	Asn	Ala	Ile	Glu	Met	Gln	Met	His	Leu	Glu
	65						70							80	
Ser	Leu	Ala	Lys	Thr	Gln	Tyr	Gly	Val	Glu	Pro	Trp	Thr	Leu	Gln	Asp
		85						90						95	
Thr	Ser	Tyr	Glu	Met	Trp	Leu	Thr	Pro	Pro	Lys	Arg	Cys	Phe	Ala	Lys
		100					105							110	
Gln	Gly	Asn	Thr	Val	Glu	Val	Lys	Phe	Asp	Gly	Cys	Glu	Asp	Asn	Val
	115						120							125	
Met	Glu	Tyr	Val	Val	Trp	Thr	His	Ile	Tyr	Leu	Gln	Asp	Asn	Asp	Ser
	130						135							140	
Trp	Val	Lys	Val	Thr	Ser	Ser	Val	Asp	Ala	Lys	Gly	Ile	Tyr	Tyr	Thr
	145						150							160	
Cys	Gly	Gln	Phe	Lys	Thr	Tyr	Tyr	Val	Asn	Phe	Asn	Lys	Glu	Ala	Gln
		165						170						175	
Lys	Tyr	Gly	Ser	Thr	Asn	His	Trp	Glu	Val	Cys	Tyr	Gly	Ser	Thr	Val
		180						185						190	
Ile	Cys	Ser	Pro	Ala	Ser	Val	Ser	Ser	Thr	Val	Arg	Glu	Val	Ser	Ile
		195						200						205	
Ala	Glu	Pro	Thr	Thr	Tyr	Thr	Pro	Ala	Gln	Thr	Thr	Ala	Pro	Thr	Val
	210						215							220	
Ser	Ala	Cys	Thr	Thr	Glu	Asp	Gly	Val	Ser	Ala	Pro	Pro	Arg	Lys	Arg
	225						230							240	
Ala	Arg	Gly	Pro	Ser	Thr	Asn	Asn	Thr	Leu	Cys	Val	Ala	Asn	Ile	Arg
		245						250						255	
Ser	Val	Asp	Ser	Thr	Ile	Asn	Asn	Ile	Val	Thr	Asp	Asn	Tyr	Asn	Lys
		260						265						270	

His	Gln	Arg	Arg	Asn	Asn	Cys	His	Ser	Ala	Ala	Thr	Pro	Ile	Val	Gln
275							280						285		
Leu	Gln	Gly	Asp	Ser	Asn	Cys	Leu	Lys	Cys	Phe	Arg	Tyr	Arg	Leu	Asn
290							295						300		
Asp	Lys	Tyr	Lys	His	Leu	Phe	Glu	Leu	Ala	Ser	Ser	Thr	Trp	His	Trp
305							310						315		320
Ala	Ser	Pro	Glu	Ala	Pro	His	Lys	Asn	Ala	Ile	Val	Thr	Leu	Thr	Tyr
							325						330		335
Ser	Ser	Glu	Glu	Gln	Arg	Gln	Gln	Phe	Leu	Asn	Ser	Val	Lys	Ile	Pro
							340						345		350
Pro	Thr	Ile	Arg	His	Lys	Val	Gly	Phe	Met	Ser	Leu	His	Leu	Leu	
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<210> 9  
 <211> 368  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> HPV6b E2 amino acid sequence including a point  
 mutation to remove biological activity

<400> 9															
Met	Glu	Ala	Ile	Ala	Lys	Arg	Leu	Asp	Ala	Cys	Gln	Glu	Gln	Leu	Leu
1							5				10			15	
Glu	Leu	Tyr	Glu	Glu	Asn	Ser	Thr	Asp	Leu	His	Lys	His	Val	Leu	His
							20				25			30	
Trp	Lys	Cys	Met	Arg	His	Glu	Ser	Val	Leu	Leu	Tyr	Lys	Ala	Lys	Gln
							35				40			45	
Met	Gly	Leu	Ser	His	Ile	Gly	Met	Gln	Val	Val	Pro	Pro	Leu	Lys	Val
							50				55			60	
Ser	Glu	Ala	Lys	Gly	His	Asn	Ala	Ile	Glu	Met	Gln	Met	His	Leu	Glu
							65				70			75	
Ser	Leu	Leu	Arg	Thr	Glu	Tyr	Ser	Met	Glu	Pro	Trp	Thr	Leu	Gln	Glu
							85				90			95	
Thr	Ser	Tyr	Glu	Met	Trp	Gln	Thr	Pro	Pro	Lys	Arg	Cys	Phe	Ala	Lys
							100				105			110	
Arg	Gly	Lys	Thr	Val	Glu	Val	Lys	Phe	Asp	Gly	Cys	Ala	Asn	Asn	Thr
							115				120			125	

Met Asp Tyr Val Val Trp Thr Asp Val Tyr Val Gln Asp Asn Asp Thr  
130 135 140  
Trp Val Lys Val His Ser Met Val Asp Ala Lys Gly Ile Tyr Tyr Thr  
145 150 155 160  
Cys Gly Gln Phe Lys Thr Tyr Tyr Val Asn Phe Val Lys Glu Ala Glu  
165 170 175  
Lys Tyr Gly Ser Thr Lys His Trp Glu Val Cys Tyr Gly Ser Thr Val  
180 185 190  
Ile Cys Ser Pro Ala Ser Val Ser Ser Thr Thr Gln Glu Val Ser Ile  
195 200 205  
Pro Glu Ser Thr Thr Tyr Thr Pro Ala Gln Thr Ser Thr Leu Val Ser  
210 215 220  
Ser Ser Thr Lys Glu Asp Ala Val Gln Thr Pro Pro Arg Lys Arg Ala  
225 230 235 240  
Arg Gly Val Gln Gln Ser Pro Cys Asn Ala Leu Cys Val Ala His Ile  
245 250 255  
Gly Pro Val Asp Ser Gly Asn His Asn Leu Ile Thr Asn Asn His Asp  
260 265 270  
Gln His Gln Arg Arg Asn Asn Ser Asn Ser Ser Ala Thr Pro Ile Val  
275 280 285  
Gln Phe Gln Gly Glu Ser Asn Cys Leu Lys Cys Phe Arg Tyr Arg Leu  
290 295 300  
Asn Asp Arg His Arg His Leu Phe Asp Leu Ile Ser Ser Thr Trp His  
305 310 315 320  
Trp Ala Ser Ser Lys Ala Pro His Lys His Ala Ile Val Thr Val Thr  
325 330 335  
Tyr Asp Ser Glu Glu Gln Arg Gln Gln Phe Leu Asp Val Val Lys Ile  
340 345 350  
Pro Pro Thr Ile Ser His Lys Leu Gly Phe Met Ser Leu His Leu Leu  
355 360 365

<210> 10

<211> 1965

<212> DNA

<213> Artificial Sequence

<220>

<223> Codon optimised and mutated nucleotide sequence  
for HPV6b E1

<400> 10

gcggccgcca tggcagacga ttccggtaact gagaacgaag gttctggttg taccgggttgg 60  
ttcatggttg aagcaatcg tca gcatccg actggtaccc agatctccga tgacgaagac 120  
gaagaagttg aagattctgg ttacgacatg gttgacttca tcgatgactc caacatcact 180  
cataactctc tggaa gacaca ggctctgtt aaccggcagg aagctgatac ccattacgct 240  
actgttcagg acctgggagg caaatatctg ggctctccgt acgtttcccc gatcaacact 300  
atcgcagaag cagttgagtc tggaaatctcc cgcgcctgg acgctatcaa actgactcg 360  
cagccgaaga aggttaaacg tcgtctgtt cagactcgta aactgaccga ctccggttac 420  
ggttatagcg aagttgaggc tggcaccggc acccaggtt aaaaacacgg tgtaccggaa 480  
aacggcggcg acggtcagga aaaggacacc ggccgcgaca tcgagggtga ggaacacacc 540  
gaagctgaag ctccgactaa ctctgttcgt gaacacgcag gtactgcggg tatcctggaa 600  
ctgctgaaat gcaaagacct ggcgcggcgt ctgctggca aattcaaaga atgcttcggc 660  
ctgtcttca ttgacactgat ccgtccgtt aagtctgaca aaactacctg tctggactgg 720  
gtttagcag gcttcggcat ccaccactct atctctgaag cattccagaa actgatcgag 780  
ccgctgtctc tgtacgcga catccagtgg ctgactaacg cttgggtat gttctgctg 840  
gtactgctgc gctttaagt aaacaaatct cgttccactg ttgctgtac tctggctacc 900  
ctgctgaaca tcccggagaa ccagatgctg atcgaaccgc cggaaatcca gtctgggtta 960  
gctgcactgt actggttcg tactggcatac tcta acgcta gca ctgttata cggtaagca 1020  
ccggaatgga tcaactcgtca gaccgttatac gaacacggc tggcagattc tcagttcaaa 1080  
ctgactgaaa tggttcagtg ggcatacgc aacgacatct gcgaggaatc tgaaattgcg 1140  
ttcgaatacgt ctcagcgtgg cgacttcgac tccaa acgctc gtgtttccct gaacagcaac 1200  
atgcaggcta aatacgtaaa agactgcgt accatgtgcgt gtcactacaa acacgcggaa 1260  
atgcgtaaaa tgtctatcaa acagtggatc aagcaccgcg gttctaaaat cgaaggtaacc 1320  
ggtaactgga aaccgatcg tca gttccctg cggccatcaga acatcgaaat catccgttc 1380  
ctgaccaaat tcaagctgtg gctgcacggt accccggaaa aaaactgcgt cgctatcgta 1440  
ggtccaccgg acactgacaa gtcttacttc tgtatgtccc tgcgttccctt cctggcggc 1500  
actgtatct ctcacgttaa ctcttcctcc catttcgtgc tgcagccact ggtagacgcg 1560  
aaagtagctc tgctggacga cgcgaccccg ccgtgttggc tctacatgg tacttacatg 1620  
cgcaacctgc tggacggtaa cccgatgtct atcgaccgt aacacaaacg gctgactctg 1680  
atcaagtgcc cggcgtgtgt ggtaaacttct aacatcgaca tcaccaagga agataaaatac 1740  
aagtacctgc ataccgtgt tactaccttt actttccca acccggttccc gtttgcgt 1800  
aacggtaacg ctgttacga actgtccaaac aactaactgga aatgcttctt cgagcgtctg 1860  
tcttcctcc tggacatcca ggactctgaa gatgaagaag atggttctaa ctctcaggct 1920  
ttccgttgc ttccgggtac tggtttcgt actctgtgag gatcc 1965

<210> 11

<211> 1119

<212> DNA

<213> Artificial Sequence

<220>

<223> Codon optimised and mutated nucleotide sequence  
for HPV11 E2

<400> 11

gcggccgcca tggaagccat cgcgaaaggagg ctcgacgcct gccaggacca gctgctcgag 60  
ctgtacgagg agaacacgcat tgacatccat aagcacatca tgcactggaa gtgcattcgc 120  
ctggagagcg tgctgttgca caaggccaag cagatgggc tgcactggaa gtgcattcgc 180  
gtgggtcccc ctctgaccgt gtcagagaca aaggccata acgcaatcga gatgcagatg 240  
cacctcgagt cgctggcgaa aacacagtac ggcgtggagc catggaccct gcaggacacc 300  
tcgtacgaaa tgtggctgac cccacctaag cgatgctcg ccaaacaggg caacacagtg 360  
gaggtgaagt tcgacggctg tgaggataac gttatggagt atgtcggtg gacgcacatc 420  
tatctgcagg acaacgacag ttgggtgaag gtgaccagct ccgtggacgc gaaggcatc 480  
tactatacct gtgggcagtt taaaacctac tatgtgaact tcaacaaaga ggcccaaag 540  
tatggctcca ccaaccactg ggaggtctgc tatggagca cggtgatttgc 600  
agcgtgtcta gcactgtgcg cgaggtgagc attgccgagc cgaccacgta caccctgccc 660  
cagacgaccg ctccgaccgt gtctgcttgc actaccgagg acggcgtgag cgctccaccc 720  
aggaagcgtg cgaggggccc aagcaccaac aacaccctct gtgtggcgaa cattcgcagc 780  
gtcgacagta ccatcaataa catcgtgacg gataactata acaagcacca gaggcgtaac 840  
aactgtcaact ctgccgcaac ccccatcggt cagctccagg gagacagcaa ttgccttaag 900  
tgcttcgct atcgctcaa cgacaagtac aagcacctct ttgagctcg ctcgtcgacg 960  
tggcactggg cctcacccga ggcacctcac aagaacgcca tcgtcaactct cacttactcc 1020  
atgtaggagc agagacagca gtttctgaac agcgtgaaga tcccacccgac gatccgtcat 1080  
aagggtcggtctcatgtcact gcatctccctgt tgaggatcc 1119

<210> 12

<211> 45

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide linker

<400> 12

agttgcggc cgctagcgat atcggtacca tatgtcgacg gatcc 45

<210> 13

<211> 45

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide linker

<400> 13

ggccggatcc gtcgacatct ggtaccgata tcgctagcgg ccgca

45

<210> 14

<211> 23

<212> PRT

<213> Human papillomavirus type 6b

<400> 14

Cys Ser Ser Ser Leu Asp Ile Gln Asp Ser Glu Asp Glu Asp Gly

1 5 10 15

Ser Asn Ser Gln Ala Phe Arg

20

<210> 15

<211> 22

<212> PRT

<213> Human papillomavirus type 6b

<400> 15

Met Glu Ala Ile Ala Lys Arg Leu Asp Ala Cys Gln Glu Gln Leu Leu

1 5 10 15

Glu Leu Tyr Glu Glu Cys

20

<210> 16

<211> 45

<212> DNA

<213> Homo sapien

<400> 16

agcttgccgc cgcttagcgat atcggtacca tatgtcgacg gatcc

45

<210> 17  
<211> 45  
<212> DNA  
<213> Homo sapien

<400> 17  
acgcccggcga tcgctatagc catggtctac agctgcctag gccgg 45

<210> 18  
<211> 23  
<212> PRT  
<213> Oryctolagus cuniculus

<400> 18  
Cys Ser Ser Ser Leu Asp Ile Gln Asp Ser Glu Asp Glu Asp Gly  
1 5 10 15  
Ser Asn Ser Gln Ala Phe Arg  
20

<210> 19  
<211> 22  
<212> PRT  
<213> Human papillomavirus type 6b

<400> 19  
Met Glu Ala Ile Ala Lys Arg Leu Asp Ala Cys Gln Glu Gln Leu Leu  
1 5 10 15  
Glu Leu Tyr Glu Glu Cys  
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<210> 20  
<211> 16  
<212> PRT  
<213> Oryctolagus cuniculus

<400> 20  
Met Ala Ala Arg Lys Gly Thr Asp Ser Glu Thr Glu Asp Gly Gly Cys  
1 5 10 15

<210> 21  
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<212> PRT  
<213> Oryctolagus cuniculus

<400> 21  
Cys Lys His Leu Asp Leu Ser Asp Pro Glu Asp Gly Glu Asp Gly Glu  
1 5 10 15  
Thr Gln Arg Gly  
20